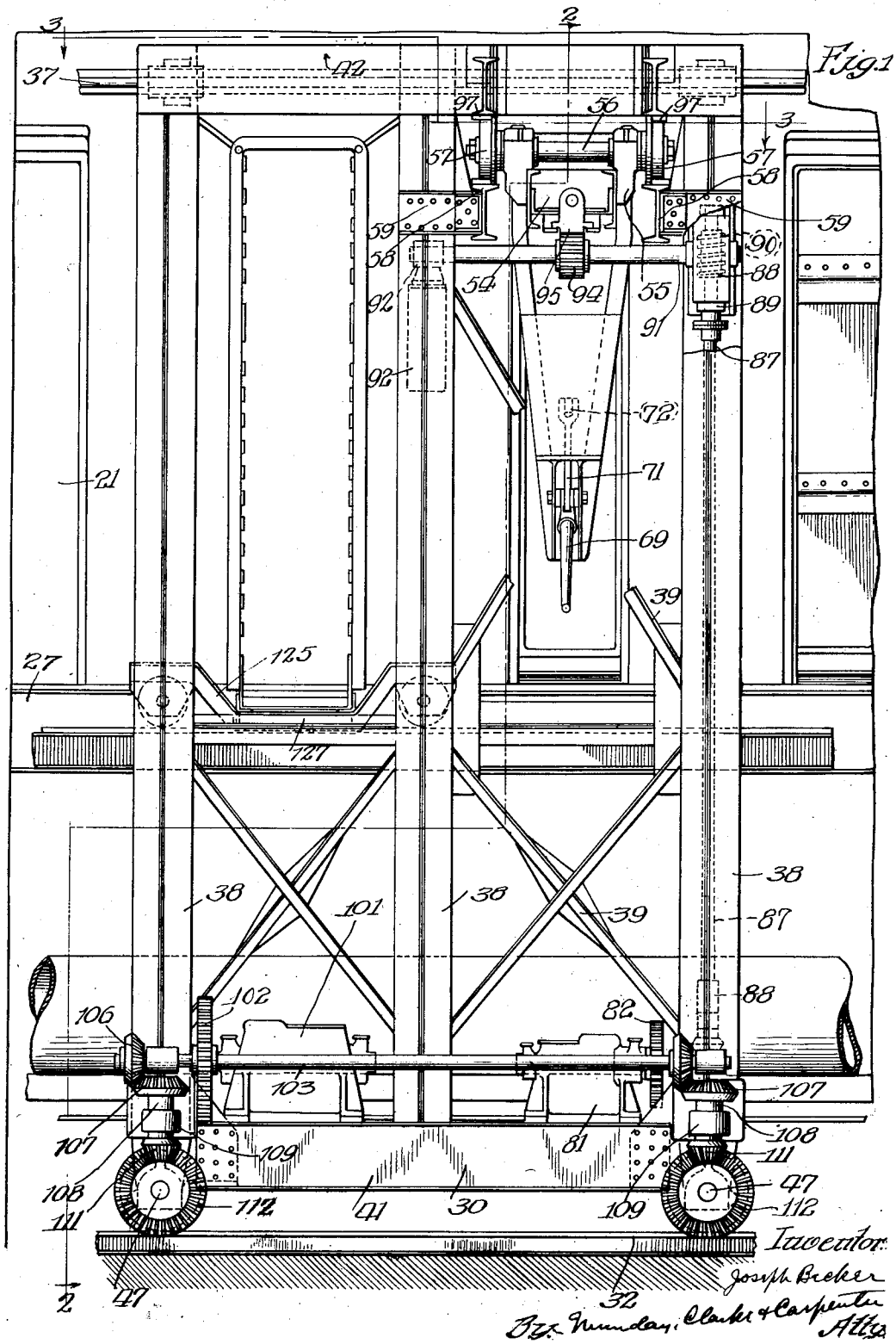
J. BECKER.

COKE OVEN DOOR LIFTING MACHINE.

APPLICATION FILED DEC. 2, 1918.

1,411,262. **Patented Apr. 4, 1922.**

5 SHEETS—SHEET 1.



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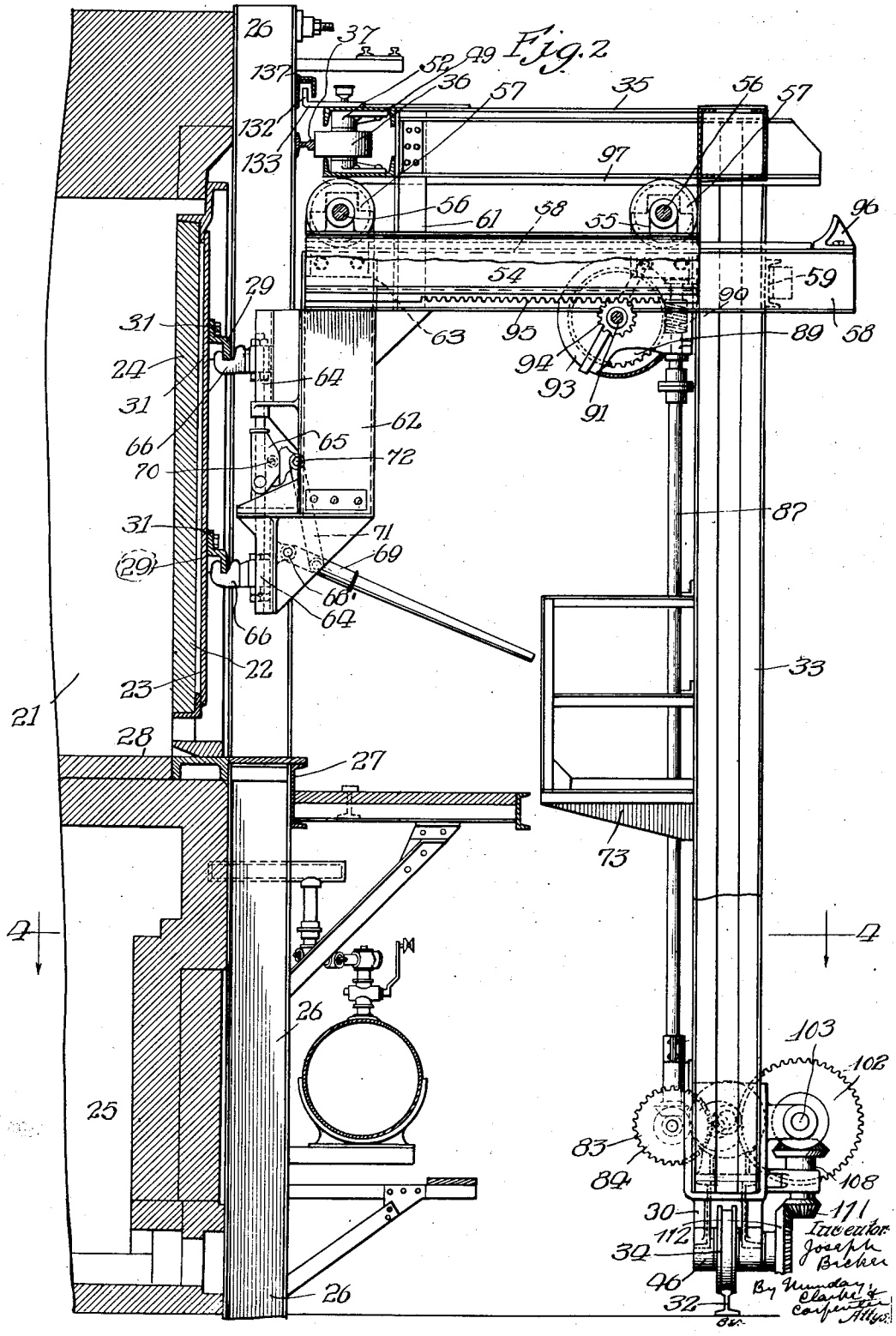
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5 SHEETS—SHEET 2.

Fig. 2



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5 SHEETS—SHEET 3.

Fig. 3

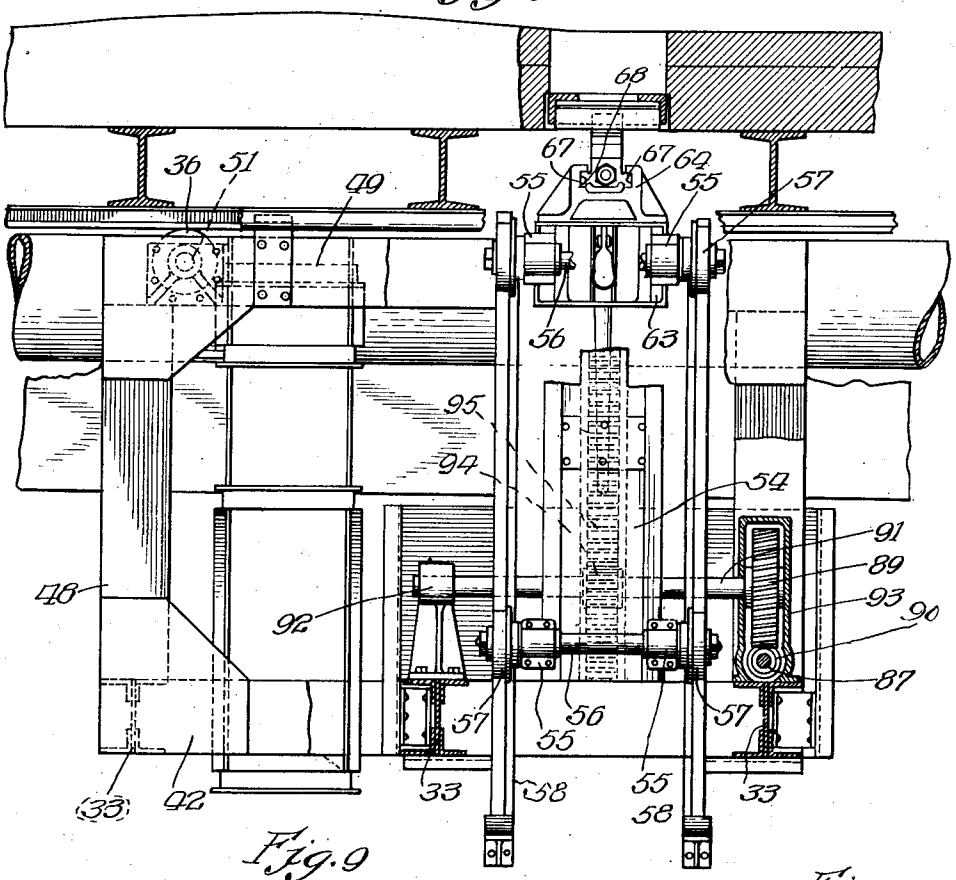


Fig. 9

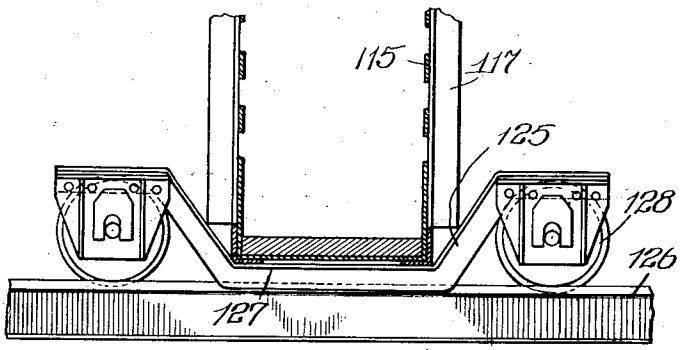


Fig. 8

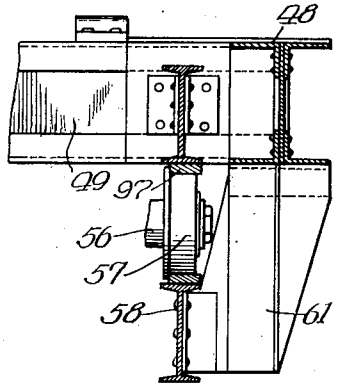
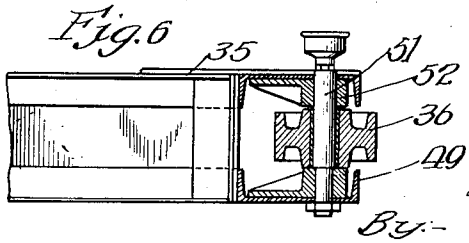


Fig. 6



Inventor:-
Joseph Becker
By:- Munday, Clarke & Carpenter
Attys.

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5 SHEETS—SHEET 4.

Fig. 4

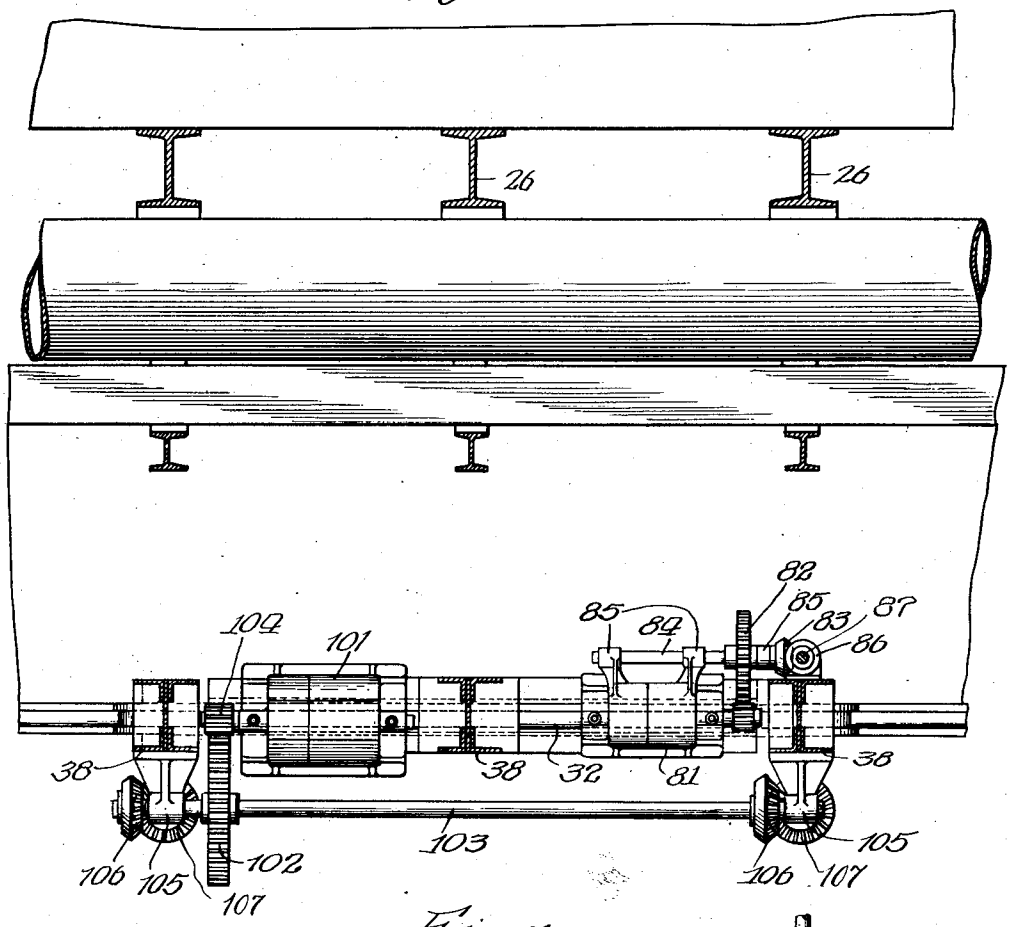
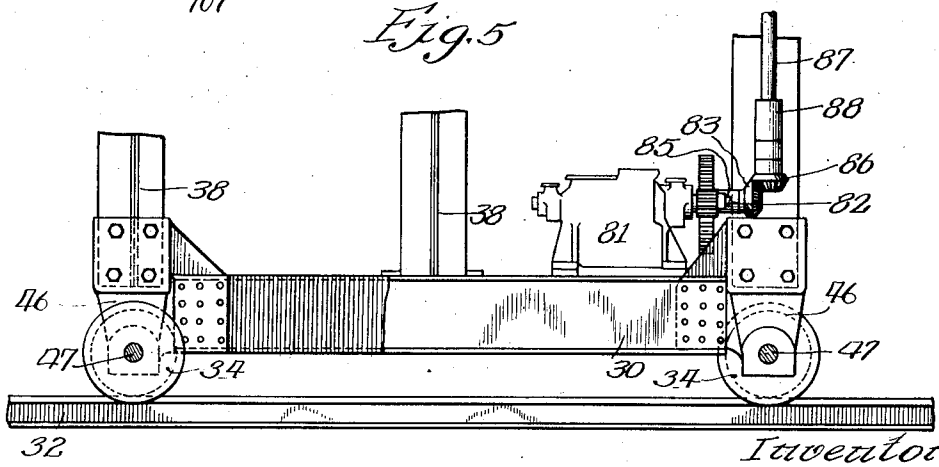


Fig. 5



Inventor:-

Joseph Becker

Munday, Clarke & Carpenter

Attys.

By:

J. BECKER.

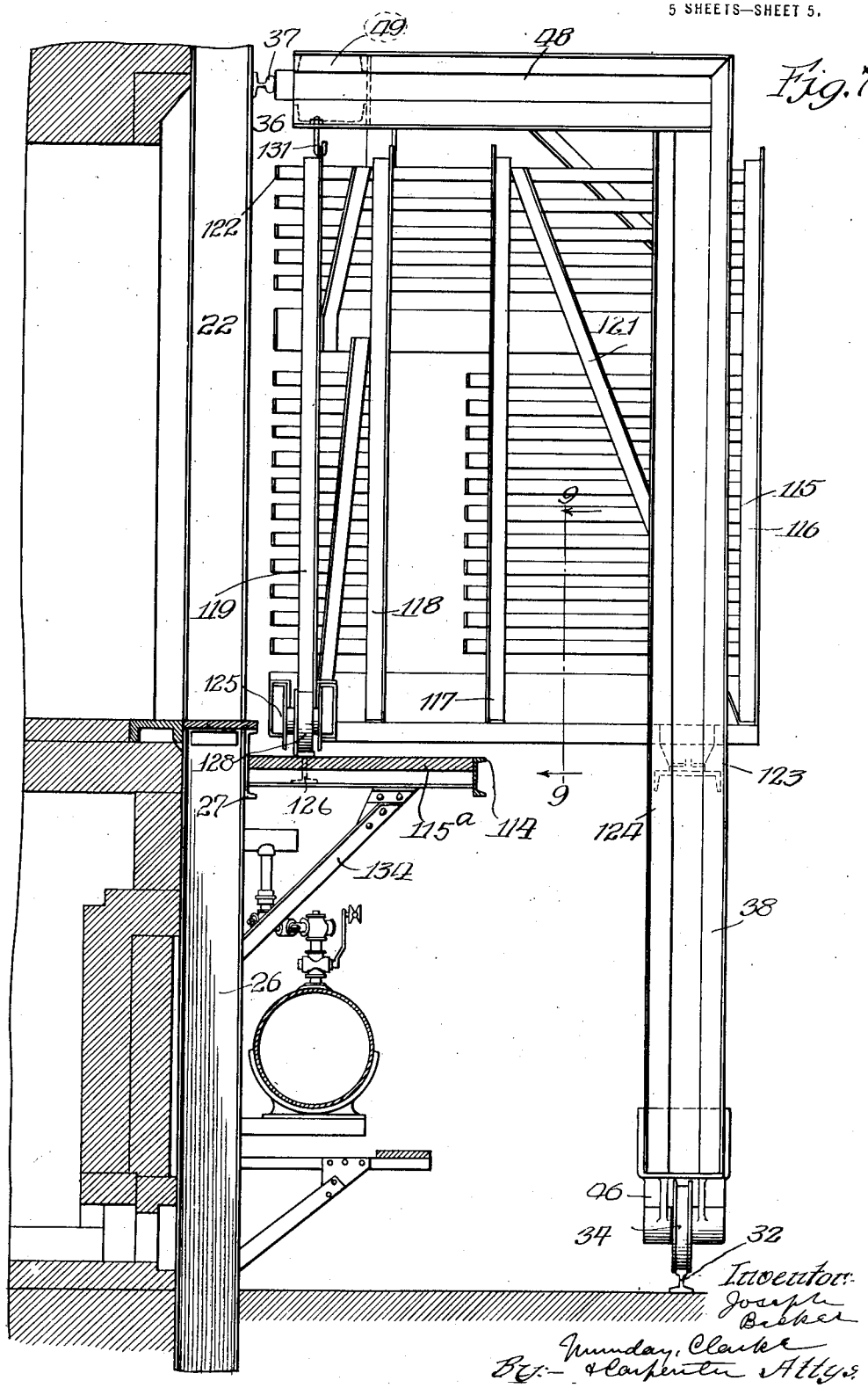
COKE OVEN DOOR LIFTING MACHINE.

APPLICATION FILED DEC. 2, 1918.

1,411,262. **Patented Apr. 4, 1922.**

5 SHEETS—SHEET 5.

Fig. 7



Inventor:
Joseph Becker
By: Munday, Clarke & Carpenter Attys.

UNITED STATES PATENT OFFICE.

JOSEPH BECKER, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO THE KOPPERS COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

COKE-OVEN-DOOR-LIFTING MACHINE.

1,411,262. Specification of Letters Patent. Patented Apr. 4, 1922.

Application filed December 2, 1918. Serial No. 264,965.

To all whom it may concern:

Be it known that I, JOSEPH BECKER, (assignor to The Koppers Company, a corporation of Pennsylvania,) a citizen of the United States, and residing in Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Coke-Oven-Door-Lifting Machines, of which the following is a specification.

This invention relates to door lifting and moving mechanisms and has particular reference to devices of this character provided to operate the doors of coking chambers in coking plants and the like, although it will be manifest as the invention is better understood that it has other valuable applications. It also relates to the coke guides provided to carry the coke as it is pushed out of the coking chamber and effect a suitable disposition thereof.

Prior to my invention it has been frequently the custom to provide a platform or bench adjacent and just beneath the oven floors and to mount on this bench two rails forming tracks upon which the door operating mechanism moves along the battery of ovens. Both the oven doors and the mechanism are of great weight and the platform or bench, which is raised a considerable distance above the ground, must be wide enough to accommodate the two tracks spaced well apart and strong enough to support the necessarily great weight.

One of the objects of the invention is to provide a door operating mechanism mounted directly upon the ground or upon the foundations of the coking plant thereby eliminating the necessity of providing the strong and expensive bench or platform to carry the door lifting and operating mechanism.

Another object of the invention is the provision of a coke-oven door operating mechanism of great power and convenient form, and operating readily in close proximity with the face of the oven battery without imposing great strain on the battery structure.

Another object of the invention is the provision of a coke guide to deliver the hot charge of coke from the ovens over the small and light foot bench or platform I substitute for the heavy and expensive one provided to carry the heavy door lifting mechanism in many prior constructions.

Another object of the invention is the provision of a door lifting mechanism and operating mechanism and coke guide mounted upon the same truck or forming parts of a single unit of mechanism and operable with power mechanism common to both.

Other objects and advantages of the invention will be apparent as it is better understood from the following description when considered in connection with the accompanying drawing illustrating a preferred embodiment thereof.

On the drawing,

Figure 1 is a front elevation of a portion of a battery of ovens and showing a combined door operating mechanism and coke guide embodying my invention;

Fig. 2 is a section taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a section taken substantially on the line 3—3 of Fig. 1;

Fig. 4 is a section taken substantially on the line 4—4 of Fig. 2;

Fig. 5 is a transverse section taken vertically through the lower portion of the truck carrying the door lifting mechanism and coke guide;

Fig. 6 is a detail section through an upper roller of said truck;

Fig. 7 is an end elevation of the combined door lifting and operating mechanism and coke guide, the oven battery being shown partially in section;

Fig. 8 is an enlarged section showing certain details of construction of the hanger support for the door suspending mechanism; and

Fig. 9 is a partial section taken substantially on the line 9—9 of Fig. 7.

For the purpose of illustrating my invention I have shown on the drawing a coking plant or battery, comprising a plurality of coking chambers 21, it being understood that the usual combustion chambers alternate with such coking chambers. These coking chambers are closed by the usual doors 22 composed of an iron outer shell 23 and an internal brick heat insulation 24. The

coking ovens and combustion chambers are mounted upon regenerators, generally indicated at 25, the particular construction of which is not shown on the drawing as it is believed unnecessary to the understanding of the present invention.

At the front wall of the ovens the usual reinforcing vertically extending heavy I-beams, channel irons or other structural metal members 26 are provided and to these upright reinforcements is secured a channel iron 27 extending along the side of the oven battery with its top edge just beneath the oven floor 28. Two cleats 29 are secured upon the outer face of each door by bolts 31 or other suitable fastening means, which cleats are adapted to be engaged by the door lifting mechanism to lift and remove the door from its opening.

In the embodiment of my invention shown on the drawing, I mount a single rail 32 upon the ground or upon the foundation of the plant or battery and upon this rail and leaning slightly against the plant or battery of ovens the door lifting and operating mechanism is supported and moves as occasion may require. This mechanism comprises a vertically disposed truck 30 upon which a suitable framework 33 is rigidly mounted. The truck is carried by two or more flanged wheels 34 running on the rail 32, and the frame 33 has a part 35 extending inwardly toward the ovens in the end of which part are mounted rollers 36 which engage a track or rail 37 mounted upon the upright reinforces 26 and above the oven doors. The upright portion of the frame consists of three main columns 38 of structural metal beam construction braced by cross-braces 39 and connected by horizontal members 41 at the bottom and 42 at the top, both the members 41 and 42 being fabricated beams of structural iron or steel. The member 41 forms the body of the truck 30 and carries beneath each end upright a pair of downwardly extending bearing brackets 46 in which a shaft 47 carrying a wheel 34 is positioned.

The horizontally extending portion 35 of the frame consists of three inwardly extending fabricated or built up beams 48, each connected to the upper end of the vertical part 33 of the frame and to a similar beam 49 disposed along side the ovens and above the doors, the two rollers 36 being mounted on shafts 51 engaging in bearings 52 in this last mentioned beam.

The door lifting and moving device is carried by a truck which is movable toward and away from the door opening in the main frame.

This truck consists of a body 54 from which four bearings 55 extend upwardly and carry two shafts 56 on which are mounted four flanged wheels 57. These wheels run on two tracks 58 mounted in the frame, one end of each track being supported at 59 from an upright 33 and the other end by a hanger bracket 61 extending down from a beam 48.

The door lifting mechanism which is carried by this truck comprising in the present instance an arm 62 of heavy built up structural metal having one end connected to the forward end of the truck at its end adjacent the ovens at 63. The depending arm 62 is provided with a pair of spaced bearings 64 for a vertically sliding device 65 carrying a pair of hooks 66 which are adapted to engage in cleats when the truck is in receiving position and the sliding device is raised. The bearings 64 provide opposed channels 67 in which edges or flanges 68 of the sliding device may move. The movement lifting the door is accomplished by the lever 69 pivoted at 68′ on the depending arm 62 connected to a link 71 which is pivoted to an ear or cam 72, pivotally connected to the sliding device 70. The end of the lever is disposed adjacent a platform 73 carried in the upright part of the frame and upon which an operator or attendant may stand. Downward movement of the lever raises the door and the truck carrying the depending arm 62 is then moved away in an outward direction from the oven carrying with it the door. This movement is produced by a motor 81 carried upon the beam 41 at the bottom of the frame and forming a portion of the main truck. Power is delivered from this motor through speed reducing gearing 82 to the bevel gear 83 on the stub shaft 84 carried in the bearings 85 on the motor housing. The bevel gear 83 meshes with a similar gear 86 on the end of the vertical shaft 87, having bearings at 88 and 89 on the right hand upright viewing Fig. 1. The vertical shaft 87 is provided with a worm 90 which engages a worm wheel or gear 89 upon a shaft 91 mounted in horizontal position just beneath the truck body, this shaft having bearings at 92 on the central upright 33 and in a housing 93 on the right hand end upright. A pinion 94 carried by this shaft engages a rack 95 mounted beneath and secured to the body of the truck. The motor is under the control of the attendant on the platform and after lifting the door he starts its motor to propel the truck to the left viewing Fig. 2. Outward movement of the truck is limited by a stop 96 located at the ends of the tracks 58. In order that the weight of the door lifting mechanism and the weight of the door carried by it may not tilt the truck endwise in amounts sufficient to derail the truck, a pair of upper tracks 97 are provided in the frame to hold the truck in proper position.

After the door is moved away from the oven the entire door lifting apparatus is

moved along the rail 32 and to this end a second motor 101 is provided upon the main truck 30. This motor drives a gear 102 upon a shaft 103 and through the agency of a pinion 104 on the armature shaft, the shaft 103 is journalled adjacent the ends of the truck in bearings 105 and carries two bevel pinions or gears 106 meshing respectively with similar bevel gears 107 upon stub shafts 108 having bearings at 109 on the frame and carrying bevel gears 111 which mesh with bevel gears 112 fastened on the ends of the shafts 47 so that movement is imparted to the wheels 34 already described and the entire apparatus shifted transversely of the battery of ovens.

The apparatus for lifting the door and moving it from in front of the oven is provided with a coke guide for directing the charge of coke from the oven outwardly over and beyond the track 32 and since this track is located at a greater distance from the oven than the edge 114 of the relatively narrow bench or platform 115ª, which is provided along and just beneath the oven entrance, the coke guide is adapted to discharge the coke over this platform also.

This coke guide consists of a skeleton structure of any preferred construction, being made up in the present instance of vertically spaced horizontally extending slats 115 connected upon the inner side of the framework formed of vertical arches 116, 117, 118 and 119 and diagonal braces 121. The ends of the slats adjacent the oven are turned out as indicated at 122 to prevent the charge of coke catching on the guide and the lower slats are interrupted between the arches 117, 119 in order to permit facilitation of inspection of the coke by an attendant standing upon the bench. The coke guide is supported under its forward end at 123 in the vertical portion of the frame of the apparatus resting upon the cross brace 124. It is supported at its end adjacent the oven by truck 125 shown in detail in Fig. 9 and mounted upon a rail 126 located upon the bench and battery of ovens. The truck 125 consists of a frame having a low hanging central portion 127 and provided with a pair of flange wheels 128, one located at each end of the truck and beyond the ends of the guide. The guide is also connected with the frame of the apparatus by a hanger 131 which provides a certain flexibility permitting the weight of the coke to be borne in part by the bench.

In order that the apparatus may under no condition fall over and away from the oven I provide a channel guide 137 secured upon the upper ends of the reinforcements 26 and engaging with an upturned lip 132 upon an extension 133 of the frame. There is little or no tendency, however, for the apparatus to fall away from the oven and this guide and extension need not be of particularly heavy construction since its sole function is to insure against an overbalancing when the apparatus is not carrying the door or guiding the charge of coke or both.

It will be manifest from the foregoing that by far the greater part of the apparatus is supported from the ground or foundation and through the truck 30 riding upon the rail 32. The truck leans over only slightly toward the oven and the pressure against the oven walls is therefore light. The bench carries merely a portion of the coke guide and this upon the rail close to the oven and consequently can be made of light structure and supported by brackets 134, a cumbersome and expensive structure heretofore frequently employed being not necessary where the function of the invention is used.

The coke guide and door lifting and operating mechanism are combined in a single unitary apparatus, the door lifting mechanism being preferably located between the one end upright and the center upright and the coke guide being located between this center upright and the other end upright. In thus providing the coke guide and the door operating mechanism in one apparatus it is only necessary in discharging the coke to position the door lifting mechanism before the door of the oven to be discharged operating it to remove the door and then moving the apparatus sufficiently to bring the coke guide into place, such movement being little more than sufficient to move the door from in front of the oven opening. The coke being discharged across the coke guide, the operation may be reversed to replace the door.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In combination: a battery of coke-ovens having coking chambers whose ends are provided with removable doors; a door operating machine of crane type, with ground-rail support therefor and adapted to travel transversely in front of the door openings; a bench extending along the face of the battery under the door-openings; and a platform secured to the front of the door-lifting machine and constituting a movable extension of said bench; whereby the said bench may be made narrow and of light construction and yet provide, in conjunction with said platform, the required working

room for operators in the removal and replacement of the doors.

2. In a door operating machine for coke ovens, in combination: a truck supported both from the ground level of the coke oven and from a side wall of the same, and movable across the door to be operated; and door operating mechanism carried by said truck for engaging and lifting the door; substantially as specified.

3. In combination with a coke oven, a rail at the ground level of the coke oven, a rail secured on the side wall of said oven, a truck supported by and movable along both said rails, and coke oven door operating mechanism carried by said truck; substantially as specified.

4. In combination with a coke oven, a monorail supported at the ground level of the oven, a truck supported by said monorail and also by the side wall of the oven, and door operating mechanism carried by said truck, substantially as specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOSEPH BECKER.

Witnesses:
HENRY LOVE CLARKE,
JOS. VAN AIKEREN.